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GB 2302226 A GB 2278731 A GB 2250153 A
GB 2117511 A GB 1605292 A

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Online: WPI

(54) Abstract Title
Tracking system

(57) An antenna array is provided with receivers (2U, 2D, 2L, 2R) and a transmitter (1). The general plane of the array is oriented with respect to an optimum transmission direction of the transmitter (1), and each of the receivers is disposed at an angle from the plane or displaced from a central zone thereof. The array has means to redirect itself so that the optimum transmission direction thereof is towards a base unit, in response to signals generated by periodical sampling and comparison of the signal strengths received from each of receivers (2U, 2D, 2L, 2R). The period of sampling the receiver signals may be between 10μs and 1s, but is ideally in the millisecond range. The antenna array may be mounted on a remote movable unit for example a TV camera adapted to receive signals from and transmit signals to a base unit.

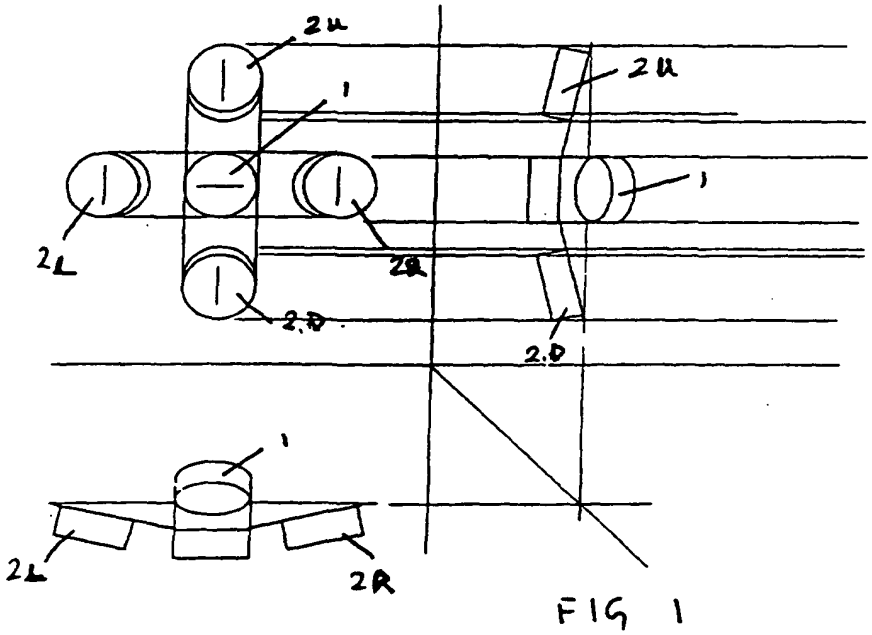

FIG 1

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The claims were filed later than the filing date but within the period prescribed by Rule 25(1) of the Patents Rules 1995.

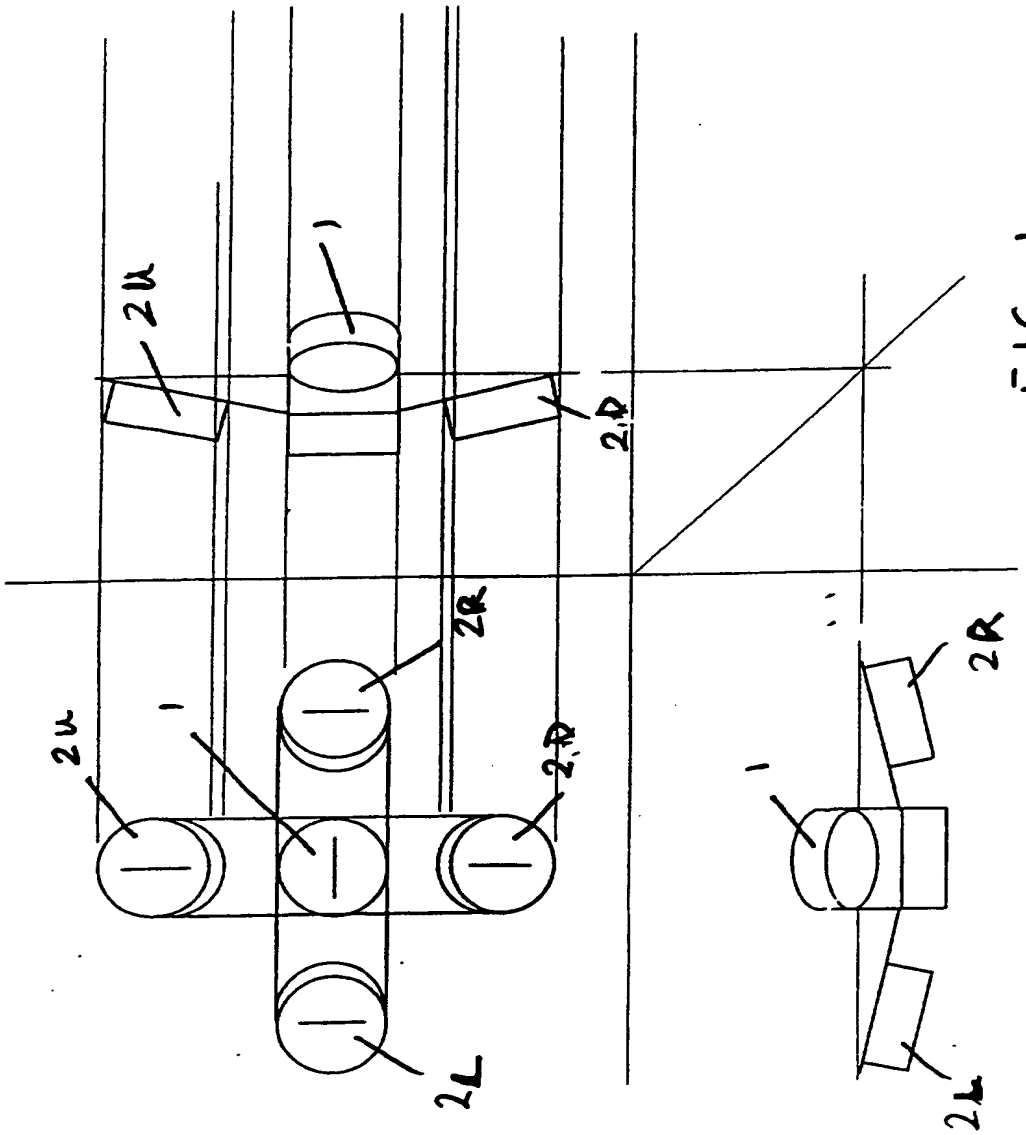

FIG 1

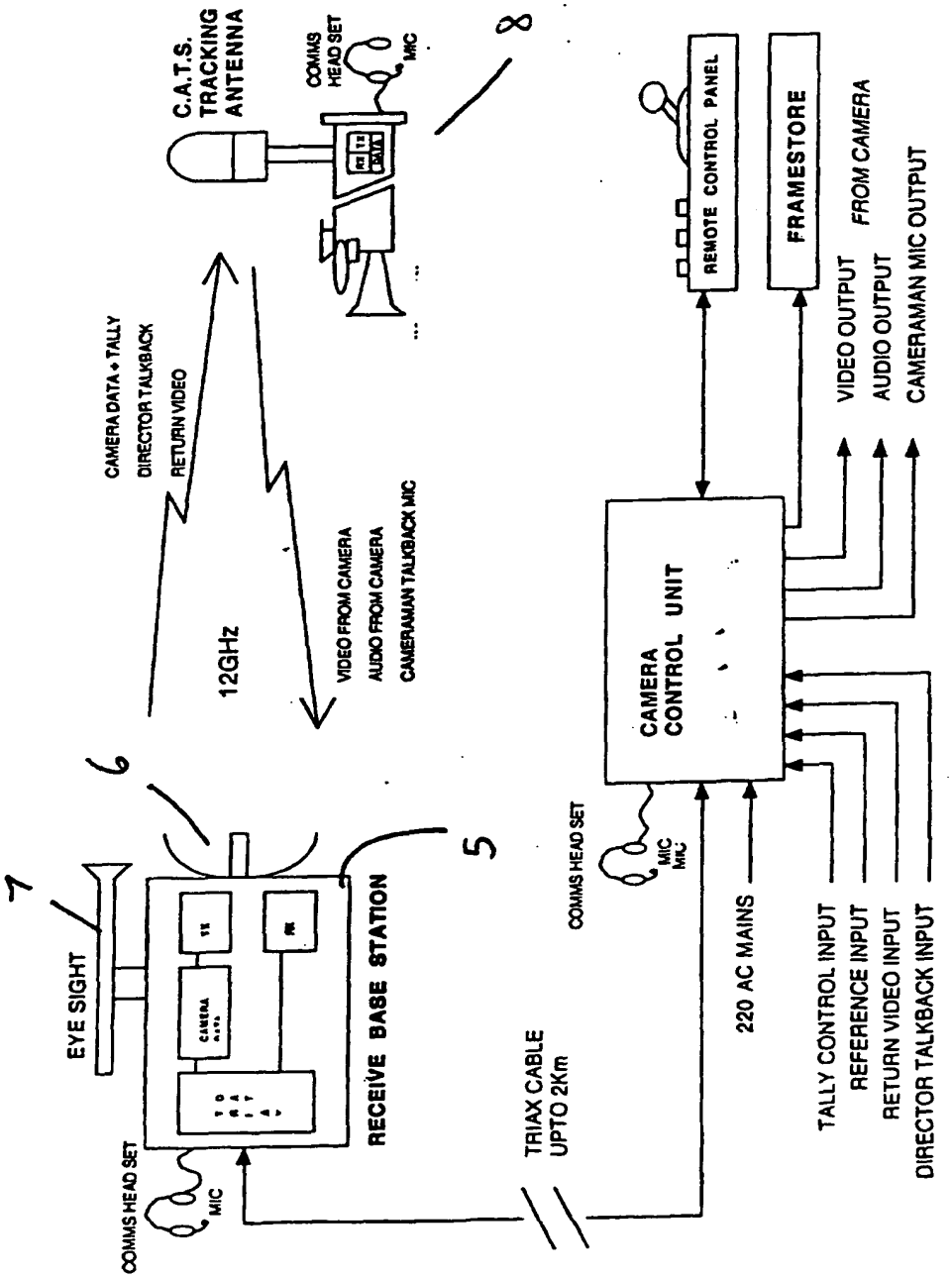
C.A.T.S.
TRACKING
ANTENNA
COMMS
HEAD SET
MIC
8
CAMERA DATA + TALLY
DIRECTOR TALKBACK
RETURN VIDEO
12GHz
VIDEO FROM CAMERA
AUDIO FROM CAMERA
CAMERAMAN TALKBACK MIC
6
7
EYE SIGHT
RECEIVE BASE STATION
5
COMMS HEAD SET
MIC
TRIAX CABLE
UPTO 2Km
REMOTE CONTROL PANEL
FRAMESTORE
CAMERA
CONTROL UNIT
COMMS HEAD SET
MIC
MIC
220 AC MAINS
VIDEO OUTPUT
AUDIO OUTPUT
CAMERAMAN MIC OUTPUT
FROM CAMERA
TALLY CONTROL INPUT
REFERENCE INPUT
RETURN VIDEO INPUT
DIRECTOR TALKBACK INPUT

FIG 2

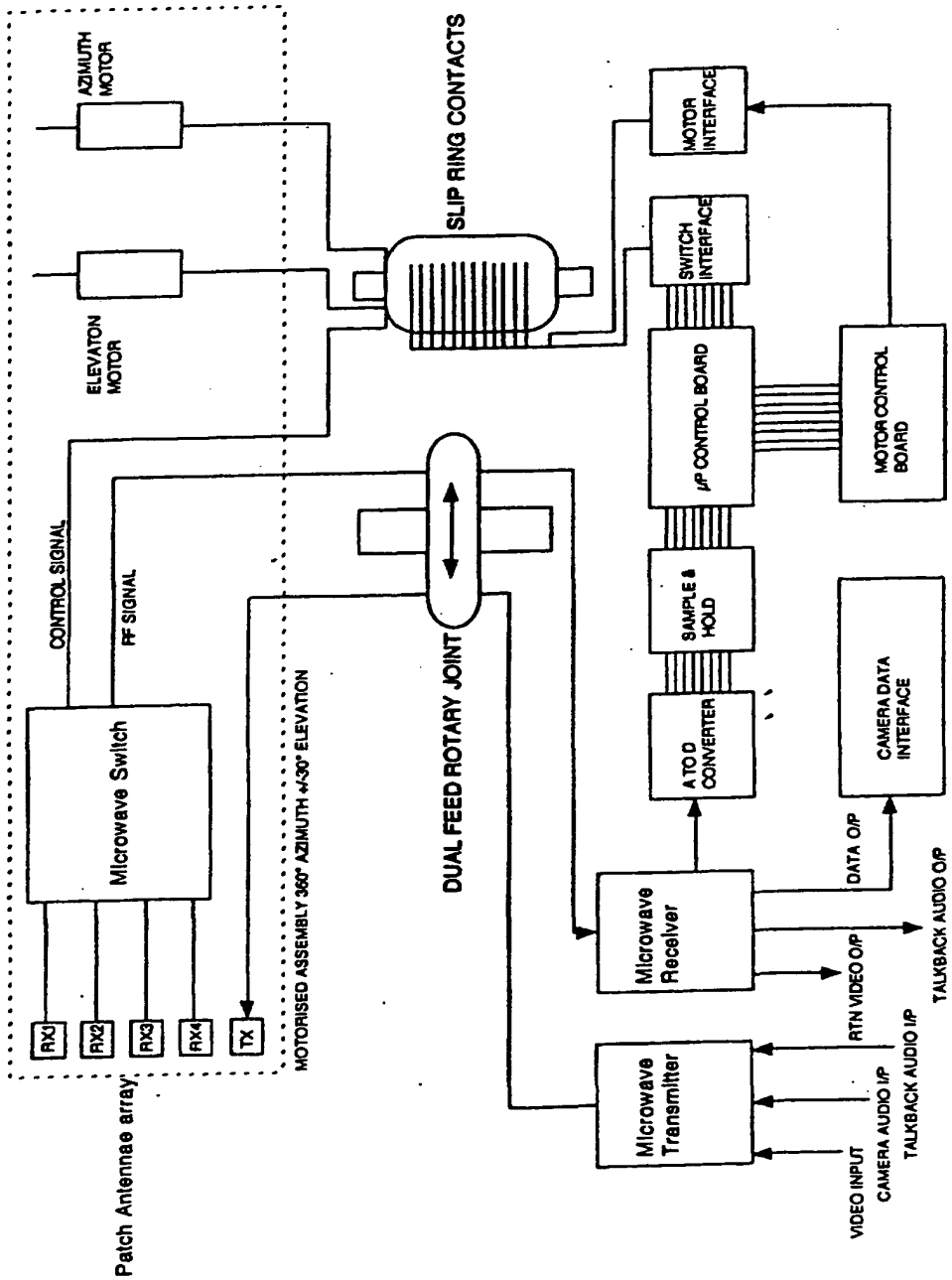
AZIMUTH MOTOR
ELEVATON MOTOR
SLIP RING CONTACTS
MOTOR INTERFACE
SWITCH INTERFACE
μP CONTROL BOARD
MOTOR CONTROL BOARD
SAMPLE & HOLD
A TO D CONVERTER
CAMERA DATA INTERFACE
CONTROL SIGNAL
RF SIGNAL
Microwave Switch
DUAL FEED ROTARY JOINT
MOTORISED ASSEMBLY 360° AZIMUTH +/-30° ELEVATION
RX1
RX2
RX3
RX4
TX
Patch Antennae array
Microwave Receiver
Microwave Transmitter
DATA O/P
RTN VIDEO O/P
TALKBACK AUDIO O/P
TALKBACK AUDIO I/P
CAMERA AUDIO I/P
VIDEO INPUT

Fig 3

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CAMERA ANTENNA TRACKING SYSTEM

The present invention relates to a camera antenna tracking system. More particularly, but not exclusively, it relates to a system which optimises alignment between a receiver of electromagnetic radiation and a transmitter thereof when either one or both are not stationary.

The invention has particular relevance to remote cameras, for example of the type which cover outside broadcast events, and their wireless receiving stations, which in turn transmit by land line to a central camera control unit, for convenience referred to herein as a base station. Transmissions between the base station and the remote station at the camera are usually by means of microwave transmissions in the frequency range of 1-25 GHz. The camera will transmit a video and probably audio signals and may also transmit a voice channel between the cameraman and the central control. All of these should be received by the base station.

The base station will transmit instructions to the cameraman and to the camera. Transmissions from the base station to the camera are superimposed on a carrier wave and it is an object of the present invention to utilise the carrier wave to align the transmission antenna of the camera so that reception at the base station is optimised. In so doing. reception at the camera of the signals emitted by the base station is also optimised.

According to the present invention, there is provided an antenna tracking system comprising an antennae array provided with receiver means and a transmitter means, the array having

a general plane oriented with respect to an optimum transmission direction of a transmitter means thereof, and in which each of a plurality of said receiver means are disposed at an angle from the general plane or displaced from a central zone thereof, means to move the array, and means periodically to sample and compare the signal strength received from each of said plurality of receiver means and in response thereto to cause said moving means to redirect the antenna array so that the optimum transmission direction thereof is directed more towards said base unit.

Preferably the transmitter means of said array is central of a plurality of receiver means.

In this case, there may be provided four receiver means, advantageously disposed equiangularly around the transmitter means.

Each receiver means may be angled obtusely with respect to the general plane.

The received signals may be sampled and the strength thereof compared periodically at predetermined intervals of time, which may be between 10 μs and 1 s. It is preferred that sampling is conducted at intervals in the millisecond range.

An embodiment of the present invention will now be more particularly described by way of example, and with reference to the accompanying drawings, in which :

Figure 1 shows an antennae array embodying the invention in front view, and side and end elevations;

Figure 2 shows schematically an overall camera system including transmissions between a remote camera unit and its base station; and

Figure 3 shows a control system for moving the antennae array in response to signals received and sent by the antennae.

Referring now to the drawings, there is shown in Figure 1 an antennae array for connection to a remote camera unit 8 of the system. The array comprises a central transmitter unit 1 surrounded, in this case, by four receiver units 2. These may be numbered as 2L, 2R, 2U

and 2D for left, right, up and down respectively. More or less receiver units may be provided. It is preferred that these units are angled obtusely to the plane of the transmitter unit 1.

It is essential that, during operation, the remote camera station 8 should remain in optimum transmission contact with its base station 5, from which signals are sent and to which signals are received by means of a parabolic transceiver 6. The base station 5 is aligned manually as closely as possible with the remote camera station 8 by means of eye-sight 7.

The base station 5 is connected by land line, namely a triax cable, to a camera control unit which may be any conventionally supplied unit. The details thereof are not relevant to the invention described herein which is concerned only with the wireless transmissions between a base station connected to the control unit and a remote camera station.

One purpose of the antennae array attached to the remote camera 8 is to transmit microwaves giving video and audio signals from the camera and also giving a channel for spoken conversation from the cameraman. These signals are preferably at a frequency in the region of 12 GHz. Signals are received at a parabolic reflector receiver 6 or other receiver attached to the base station 5. The parabolic reflector 6 is also used to transmit signals to the remote camera 8, which signals include camera data and tally, a return conversation channel and any other information which is required by the remote camera 8. These return signals are received by the receivers 2L, 2U, 2R and 2D.

As is apparent from Figure 3, the received signals are fed to a comparitor whereby their relative strengths are compared. The best received signal or combination of good signals is fed to the general processing systems of the camera unit 8, but the comparison between the signals is also used to assess which one or more of the receivers 2 is most advantageously directed, as regards the transceiver source 6.

Having determined which signal is the strongest, a pair of motors, one controlling horizontal movement and one controlling vertical movement, may be actuated to move the entire array so that the transmitting unit 1 is directed more towards the receiver 2 giving the strongest

signal and therefore towards the transceiver dish 6. Each sampling and therefore instruction to move the array should take place periodically with an interval of several milliseconds, although shorter or longer periods are possible. Hence, provided that the camera unit 8 remains relatively stable with respect to the base unit 5, it will eventually align itself substantially accurately with the parabolic transceiver 6. Small movements of either the camera unit 8 or the base station 5 can be accommodated by means of the antennae array and associated circuitry. However, major movements of the camera unit 8 will require the base station 5 to be redirected accordingly.

CLAIMS:

1. An antenna tracking system comprising an antennae array provided with a plurality of receiver means and a transmitter means, the array having a general plane oriented with respect to a transmission direction between a transmitter means thereof and a base unit, and in which each of said plurality of receiver means is disposed at an angle from the general plane or displaced from a central zone of the array, means to move the array, means periodically to sample the signal strength received from each of said plurality of receiver means, means to compare said signal strengths and in response thereto to cause said moving means so to redirect the antenna array that the transmission direction thereof is directed more towards said base unit.

2. An antenna tracking system as claimed in claim 1, wherein the transmitter means of said array is central of said plurality of receiver means thereof.

3. An antenna tracking system as claimed in claim 2, wherein four receiver means are provided, advantageously disposed equiangularly around the transmitter means.

4. An antenna tracking system as claimed in any one of the preceding claims, wherein each receiver means is angled obtusely with respect to the general plane.

5. An antenna tracking system as claimed in any one of the preceding claims, wherein the received signals are sampled and the strength thereof compared periodically at predetermined intervals of time.

6. An antenna tracking system as claimed in claim 5, wherein each predetermined interval of time is between 10 μs and 1 s.

7. An antenna tracking system as claimed in either claim 5 or claim 6 wherein sampling and comparison is conducted at time intervals in the millisecond range.

8. An antenna tracking system substantially as described herein with reference to the Figures of the accompanying drawings.

9. A remote movable unit adapted to receive signals from and transmit signals to a base station and comprising an antennae tracking system as claimed in any one of the preceding claims.

10. A remote movable unit, as claimed in claim 9, wherein the mobile unit is a camera.

The Patent Office

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Application No:	GB 9806626.9	**Examiner:**	C R Brain
Claims searched:	All	**Date of search:**	5 August 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): H1Q (QAX); H4D (DFBB, DFBC, DLAB, DLFA, DRPF)

Int Cl (Ed.6): G01S 3/28, 3/30, 3/32, 3/36, 3/42, 13/44, 13/48

Other: Online WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB2302226A	(Thomson-CSF) whole document	At least 1.
X	GB2278731A	(GEC-Marconi) whole document.	1-5.
X	GB2250153A	(Siemens) whole document.	At least 1.
A	GB2117511A	(Cook)	
X	GB1605292	(Marconi) whole document.	At least 1.

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.